Create an Economic CNG Fueling Infrastructure by Adding Home Fueling and Small Stations

NGVTF Technical Committee Meeting

Dallas, TX

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FuelMaker

Required CNG Infrastructure Station Mix

- High capacity fast-fill private/public stations ($200K and up)
- Mini fast-fill public stations ($80K to $200K) *
- Light to medium capacity private stations ($10K to $200K) *
  - Fast-fill
  - Time-fill
  - Combination time-fill/fast-fill
- Residential ($999) *

* ***FuelMaker designs and builds systems for these applications***

How Many Stations Are Needed to Make a Viable Infrastructure?

- Diesel studies show infrastructure required for acceptance as a viable fuel, is from 10% to 20% of gasoline infrastructure
- Dedicated AFV studies show same 10% to 20% requirement
- Therefore minimum of 20,000 CNG stations required for a viable fueling infrastructure

U.S. Fueling Infrastructure (Today & Proposed)

	Stations	Vehicles
Gasoline Today	180,000	221,000,000
CNG Today[1]	1,200	110,000
CNG at end of 10 Year Program[2]	20,000	1,100,000
CNG Beyond 10 Years[3]	20,000	2,800,000

[1] 600 public stations
600 private stations

[2] 6,900 large stations fueling 111 vehicles per station
13,100 mini fast-fill stations fueling 24 vehicles per station

[3] 6,900 large stations fueling 375 vehicles per station
13,100 mini fast-fill stations fueling 24 vehicles per station

Cost Comparison of Large & Mini Fast-Fill Station Infrastructure Options *(Assumes no Subsidies)*

	Large Station Design Target (note #1)	Today's Infrastructure Actual Operation	Mini Fast-Fill Station (note #2)	Building Large Stations at Mini Fast-Fill Volumes	During Building of Infrastructure with Large/Mini Combination	After Building of Infrastructure with Large/Mini Combination
Number of stations		1,200			20,000	20,000
Number of vehicles		110,000			1,071,165	2,818,820
Vehicles per station per day	111	92	24	24	54	141
GGEs per vehicle per day	5.8	2.9	5.8	5.8	5.8	5.8
GGEs per year	200,000	100,000,000	42,625	42,625	1,938,379,776	5,100,937,213
Capital & Maintenance	$ 0.41	$ 0.88	$ 0.57	$ 2.02	$ 0.46	$ 0.22
Gas, Electricity, Ohd's, Margins	$ 1.02	$ 1.02	$ 0.97	$ 1.02	$ 1.01	$ 1.02
Total cost per GGE	**$ 1.43**	**$ 1.90**	**$ 1.53**	**$ 3.04**	**$ 1.46**	**$ 1.24**

Note #1

- **May take up to 2 years to develop enough customers**
- **Limited number of stations built annually (cost and customer constrained)**
- **Initial years will operate at lower capacity**

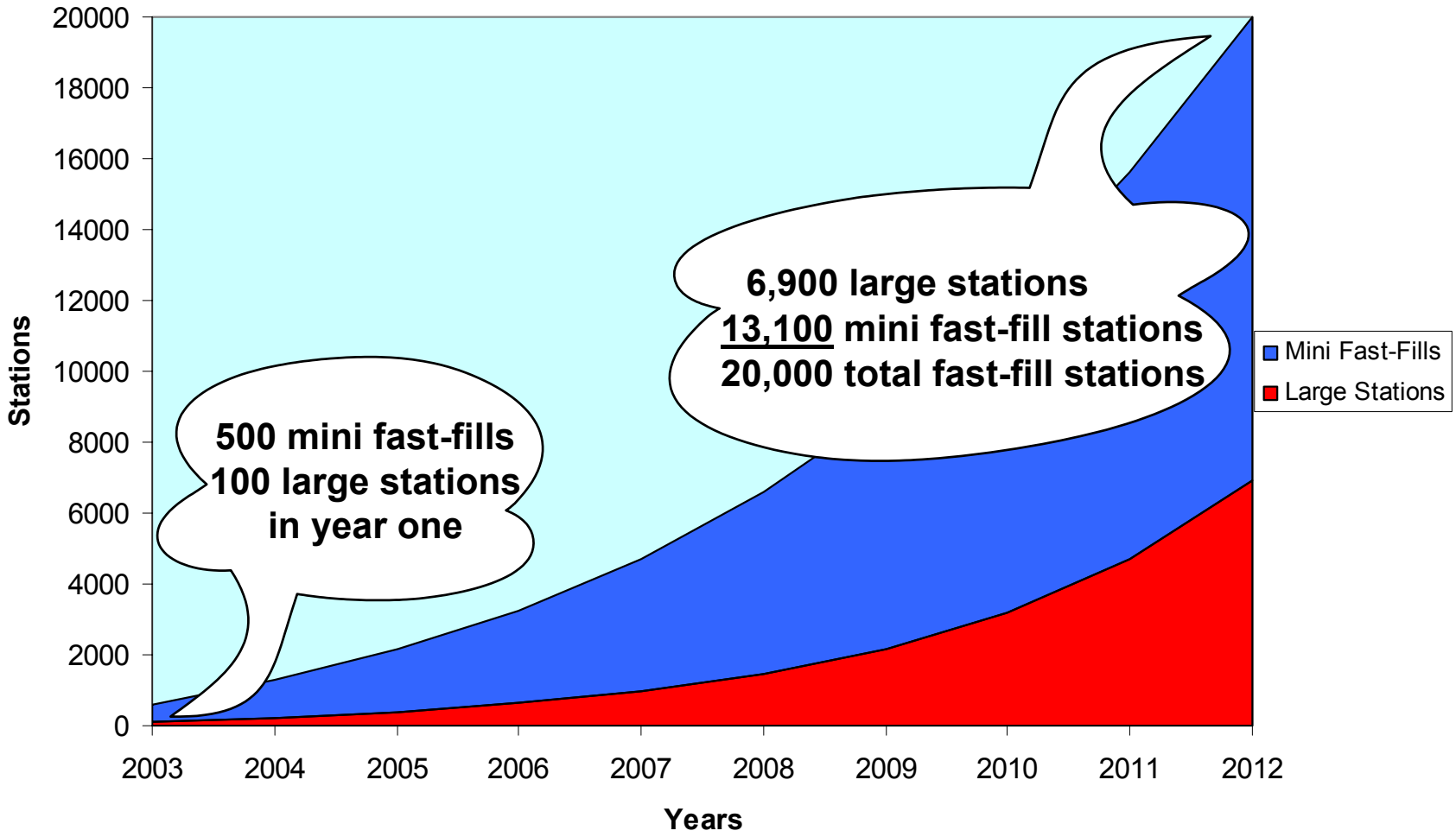
Note #2

- **Easier to find 24 customers and load immediately**
- **Can build 4 mini fast-fills for the price of 1 large station**

Note #3

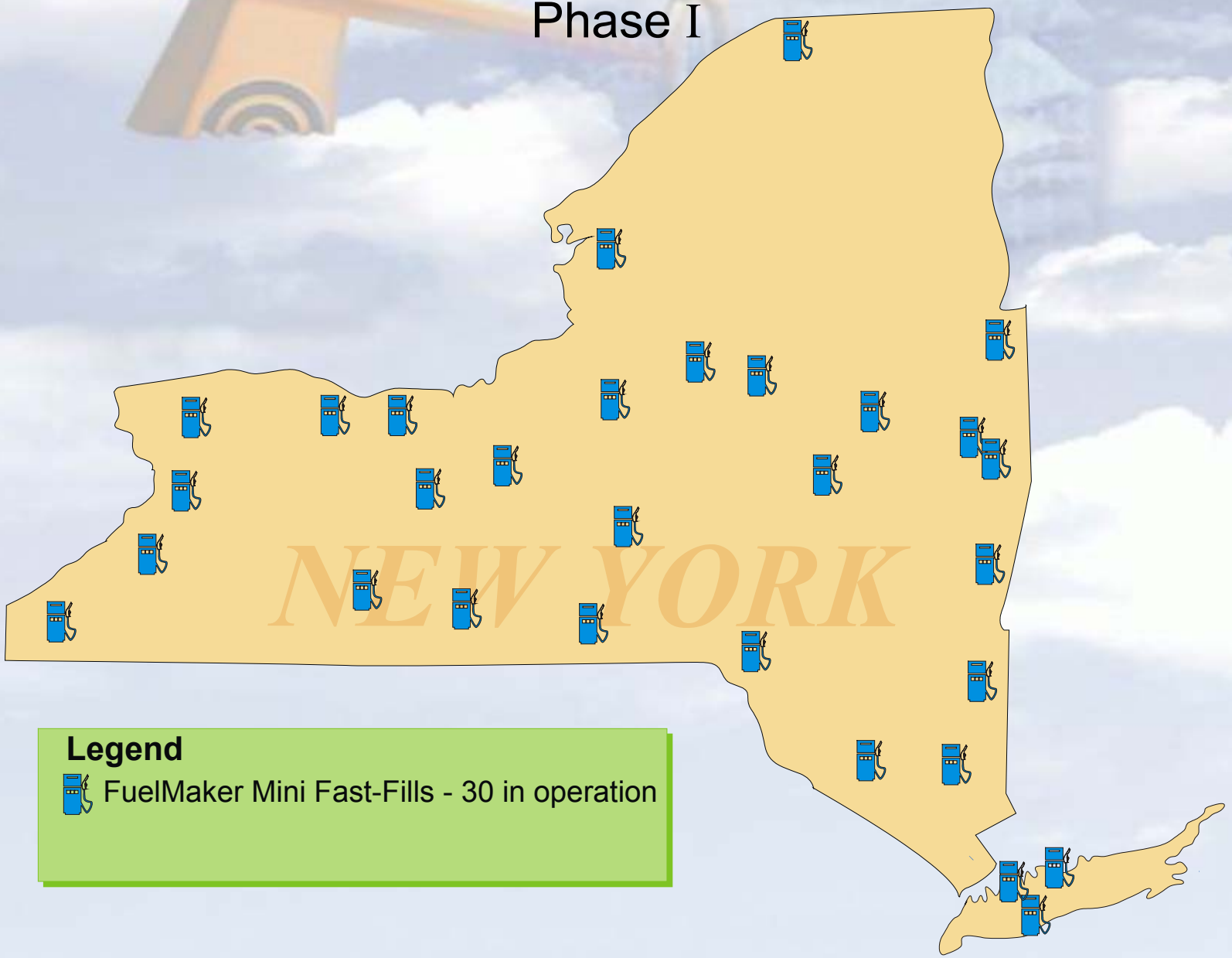
- **Infrastructure capital cost of 1/3 to 1/2 of large station option**

U.S. CNG Cumulative Station Mix



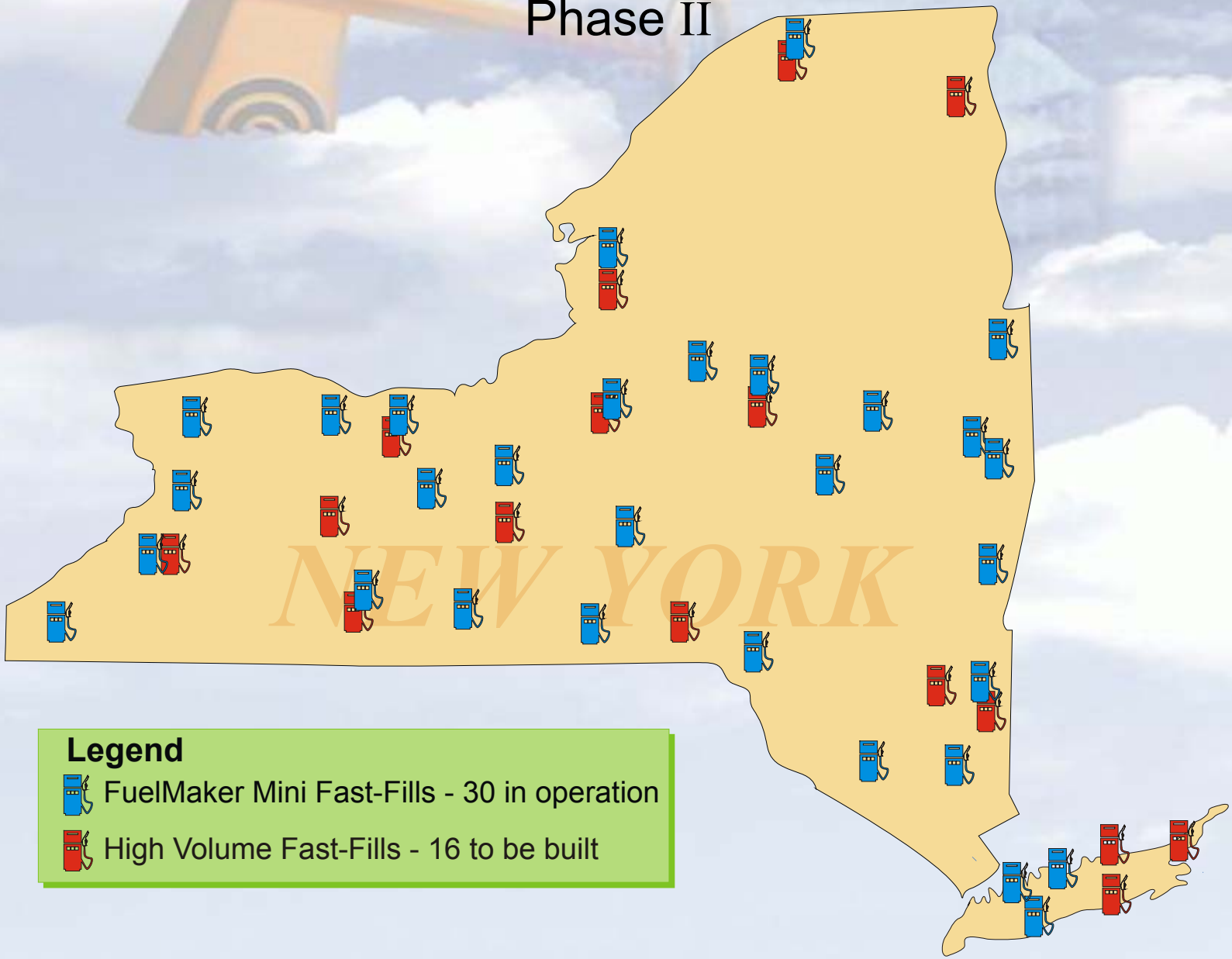
NY State Clean Fuel Vehicle Program

Phase I



NY State Clean Fuel Vehicle Program

Phase II



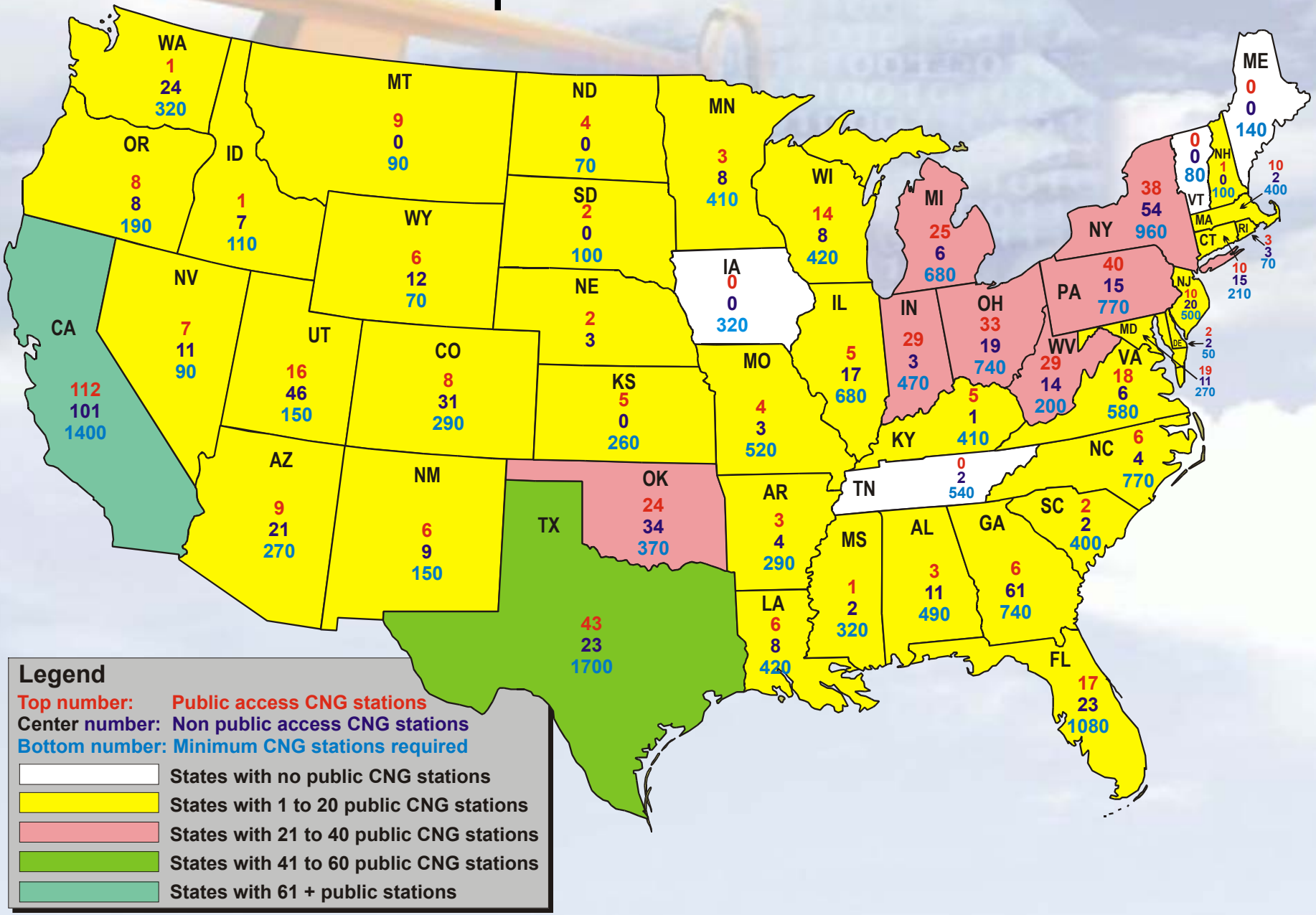
Mini Fast-Fill Stations - New York State

New York State DOT Mini Fast-Fills

FuelMaker Fleet Applications
Public Works - Fulton County GA

New FuelMaker Public Fast-Fill Station

Present & Required CNG Infrastructure

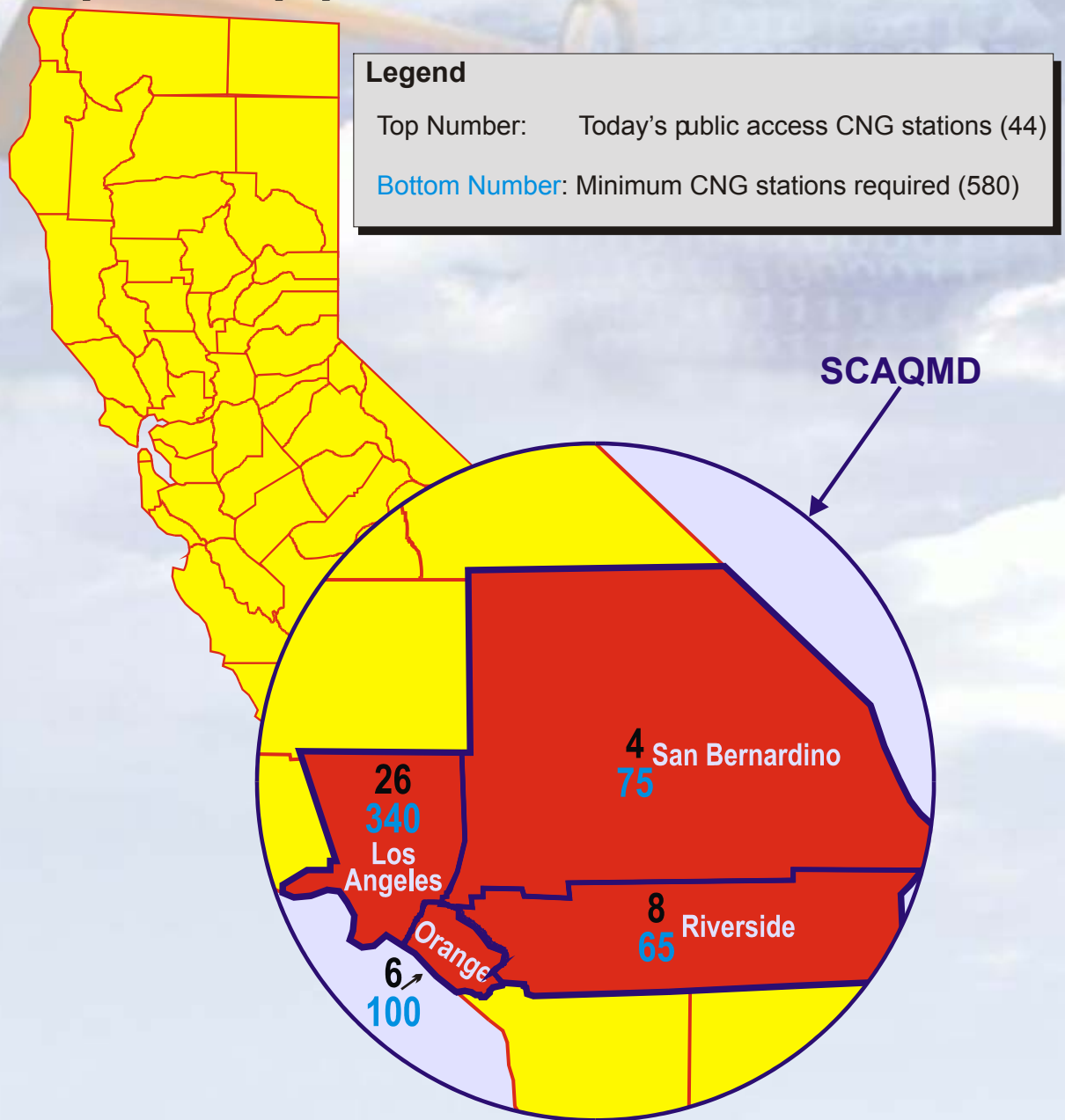


Legend

Top number: Public access CNG stations
Center number: Non public access CNG stations
Bottom number: Minimum CNG stations required

- States with no public CNG stations
- States with 1 to 20 public CNG stations
- States with 21 to 40 public CNG stations
- States with 41 to 60 public CNG stations
- States with 61 + public stations

Sample Application to SCAQMD



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American Honda - Torrance, CA
Private Fleet Fast-Fill

Port of L.A. - Los Angeles, CA
Combination Time-Fill/Fast-Fill

Toronto Hydro - Toronto, ON
Time-Fill

City of L.A. - Los Angeles, CA
Fast-Fill

City of Walnut, CA
Combination Time-Fill/Fast-Fill

San Marcos Unified School District Combination Time-Fill/Fast-Fill

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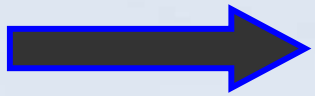
FuelMaker HRA

Product launch late 2003

VRA \ HRA Evolution

VRA

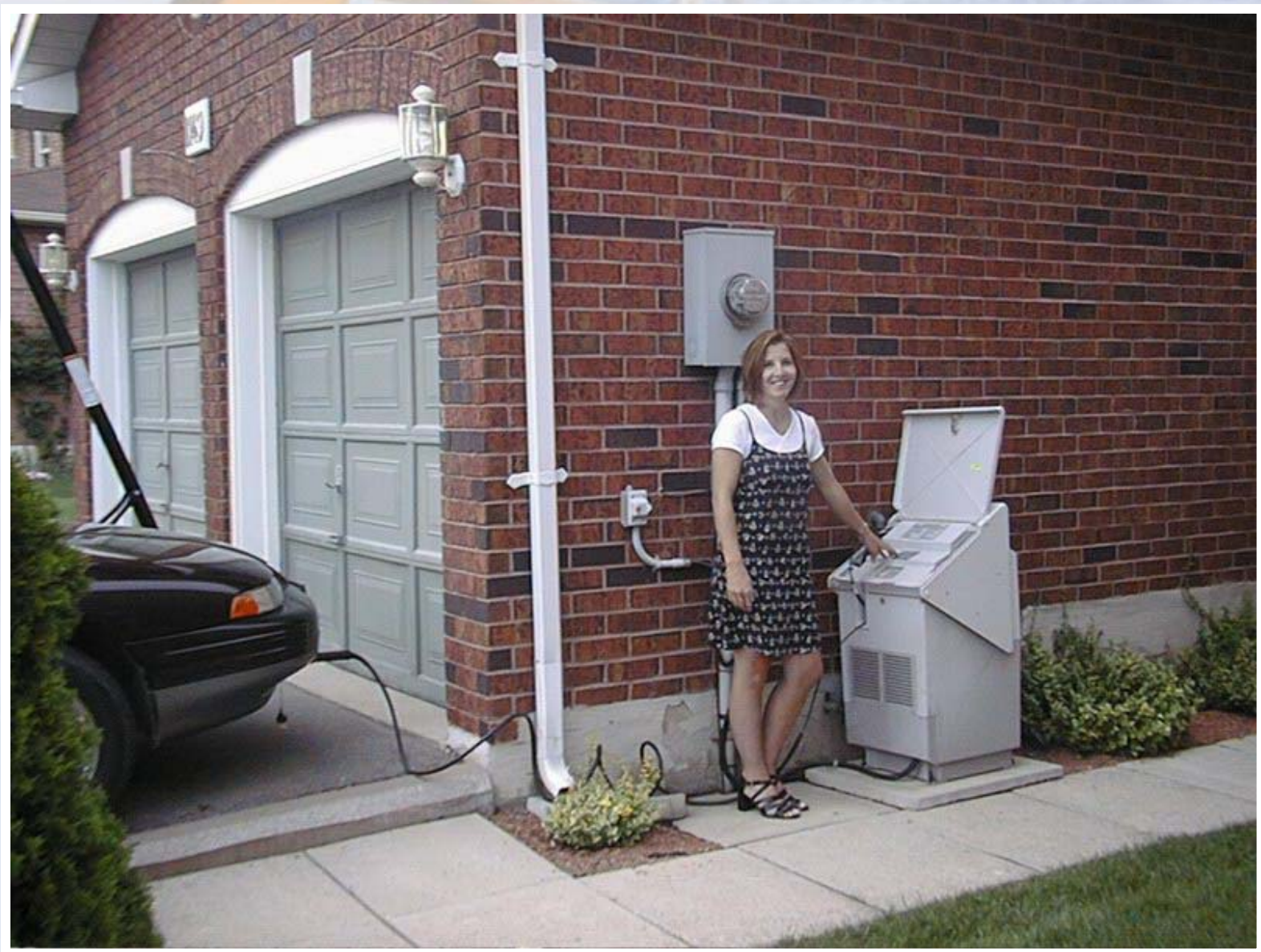
- $US6000
- 1 GGE/hr
- 4000 hr service
- External dryer
- Commercial use
- Outdoor installation
- 45 dbA
- 240 Volt



HRA

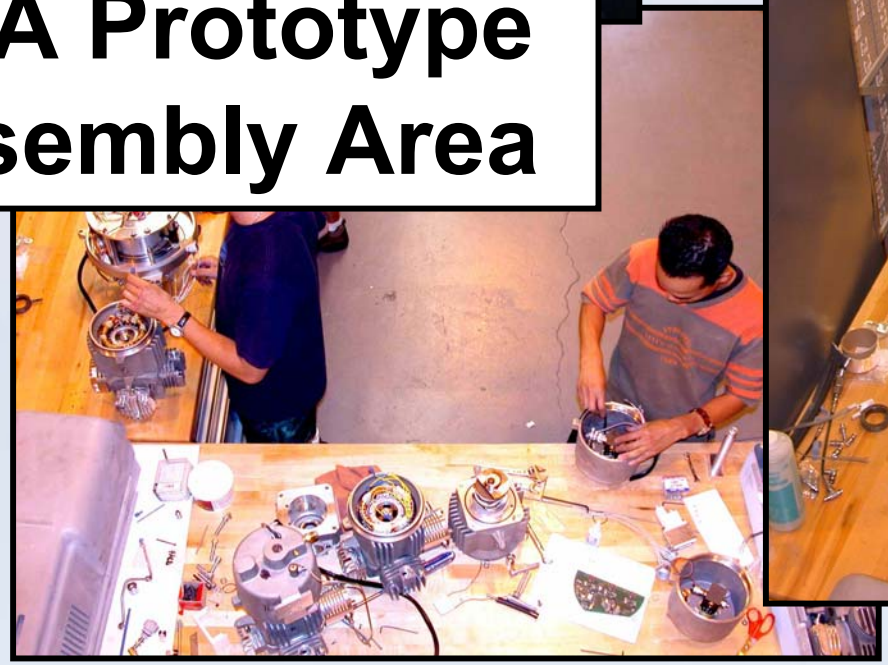
- $US999
- H2 & Nat. Gas
- .3 GGE/hr
- Maintenance - free
- Integrated dryer
- Residential design
- Indoor installation
- 38 dba
- 120/240 volt
- Integrated ventilation and gas detection

FuelMaker VRA



FuelMaker HRA

HRA Prototype Assembly Area



HRA Development - Funding

Supported by:

- DOE
- SCAQMD
- CARB
- CEC
- GRI
- Honda
- Canadian Federal Government

HRA Development Time Line

- Key Target Dates
  - Alpha prototypes currently under test
  - Focus group evaluation (functionality, color, names) - completed
  - Product announcement/press conference with demo unit display at IANGV/NGVC, October 7th, 2002, Washington DC
  - Deliver first production HRAs - October, 2003

NGV 2002

Clean Transportation For A Livable World

MEDIA RESULTS REPORT

The Columbus Dispatch

FRONT-PAGE

Honda plans natural-gas car fueling from home

By Mark Niquette
THE COLUMBUS DISPATCH

Honda is looking forward to the day that you can pull your Honda Civic into the garage at home and fill it up with natural gas.

Such a scenario isn't far away. Plans were announced yesterday for a new home-based fueling appliance that can be used with natural-gas powered vehicles, including the Civic GX, which is made in central Ohio.

Consumers will be able to mount the refueling appliance in the garage and use the home's existing natural-gas supply line.

The company hopes the appliance, to be available late next year, will help move natural-gas powered cars into the mainstream.

"If you ask 100 people what — and are better for the environment, with fewer harmful emissions.

The Civic GX, which Honda says has the cleanest-burning internal-combustion engine in the world, gets 31 mpg in city driving and 34 on the highway.

There are 130,000 natural-gas powered vehicles already on the road nationwide, but most are trucks, buses or taxicabs in business and government fleets, said Colleen MacMillan of the Natural Gas Vehicle Coalition.

Honda has been making the Civic GX at its East Liberty plant since 1998 but produces only about 1,000 a year, Bienenfeld said.

The Ohio Environmental Protection Agency has three natural-gas Civics in its central Ohio fleet. Although they operate well, finding a place to refuel them has been a problem, spokeswoman Heather Lauer said.

Columbia Gas has a fueling station at its operations center off Goodale Boulevard, but other fueling spots are few and scattered, spokesman Steve Jablonski said.

The problem: Companies won't invest in fueling stations until more vehicles are pro-

Amy Chaput of the FuelMaker Corp. on Tuesday used a natural-gas fuel pump that can be installed in garage or outside a home.

Honda and FuelMaker unveil device for at-home natural gas refueling

System uses existing supply line

Associated Press

WASHINGTON, D.C. — Trips to the gas station could warming because they burn less carbon. But their specialized tanks are more expensive and have shorter range than

washingtonpost.com

In Overdrive

Warren Brown

Saying 'Goodbye' to the Pump

Consider saying "goodbye" to the gas pump. Consider fueling your car at home.

Buyers of the natural gas-powered Honda Civic GX will be able to do that, beginning next year.

Honda has signed an agreement with Toronto-based FuelMaker Corp. to supply Civic GX owners with a natural gas, home-fueling device called "Phill." The wordplay is intended. The idea is to personalize Phill, to make it a part of the household, if not the family.

Associated Press national wire with photo

BUSINESS

Los Angeles Times

Natural gas stations

Efforts to market natural gas-powered vehicles have long been frustrated by a dearth of public refueling stations.

Now Toronto-based FuelMaker Corp. has developed and will begin selling a home fueling system that hooks into residential gas lines and makes it possible to fill a natural gas vehicle's

The Civic GX sedan uses a 1.7-liter four-cylinder engine with a range of up to 220 miles on an eight-gallon tank of compressed natural gas. Base price $20,510, and Honda figures it will sell about 5,000 a year.

Honda describes the GX as a "nearly zero-emissions" car, and the California Air Resources Board certifies it as a super

ALSO –

Bloomberg News national wire

Dow Jones International Business wire

Kyodo News international wire

Reuters national wire

17M

IMPRESSIONS

M. TEBO
10.21.2002

News
ENVIRONMENT

Natural way to pump gas — at home

Honda and California seek to jump-start natural gas cars

Joe Marquette / AP

Amy Chaput of the FuelMaker Corp. shows how its natural gas fuel pump works. The pumps are meant to be installed in homes or other buildings with natural gas connections.

Miguel Llanos
MSNBC

Oct. 9 — Aiming to boost the sale of

MSNBC Live Vote RESULTS

Would you be interested in buying a natural gas car if you could fill up at home?

*** 12578 responses**

Yes, the benefits outweigh the cost of the pump. 77%

No, it doesn't feel reliable. 13%

Can't decide. 9%

MSNBC INTERACTIVE

Survey results tallied every 60 seconds. Live Votes reflect respondents' views and are not scientifically valid surveys.

HONDA APPEARED ready to step up to the challenge, saying it would start to sell a natural gas Civic GX to consumers nationwide next spring.

"Home refueling will help to increase consumer acceptance of natural gas-powered vehicles like the Civic GX by making home refueling affordable and convenient," Robert Bienenfeld, American Honda's product manager, said in a statement Tuesday. "Our research indicates people like the idea of being able to refuel their vehicles at home."

Honda said the Civic GX, which has been sold to government and commercial fleets since 1998, has a range of up 220 miles on one fill and a suggested retail price starting at $20,510. Natural gas cars have also been sold to consumers in Arizona, where a program has been in place for several years.

The GX produces "nearly zero emissions," Honda said, and is certified by the Environmental Protection Agency "as the first and only internal combustion vehicle to meet the cleanest engine emission standards."

Conclusion

- Build required CNG fueling infrastructure at a capital cost of 1/3 to 1/2 of large station option

- Infrastructure mix composed of:
  - High capacity fast-fill private/public stations
  - Mini fast-fill public stations *
  - Light to medium capacity private stations *
  - Low cost home fueling *

* ***FuelMaker designs and builds systems for these applications***